The other point is the spreading of bacilli within the families. In the large majority of cases, only the individual first found harboring the bacilli at any time gave positive cultures. But in fourteen families the infection spread to other members of the family, in one instance, to seven out of thirteen children.

Quarantine had to be maintained for most widely varying times. Table V. will give the length of quarantine in twenty-six clinical cases that came under our observation during this period. This is the time computed from the reporting of the case to the health office to the release on two successive negatives.

TABLE V.

| Days of duration of quarantine— | Cases. |
|---|---|
| 10- 20 days | 1 |
| 20- 30 " | 7 |
| 30- 40 " | 8 |
| 40- 50 " | 1 |
| 50-100 " | 8 |
| 100-150 " | 0 |
| Over 150 " | 1 |
| Total | 26 |

The average time of quarantine was 45 days from the commencement of trouble; the extremes from 15 to 153 days.

In the purely germ cases its duration was as follows:

TABLE VI.

| Days of duration of quarantine— | Cases. |
|---|---|
| 10- 20 days | 37 |
| 20- 30 " | 43 |
| 30- 40 " | 18 |
| 40- 50 " | 14 |
| 50-100 " | 12 |
| 100-150 " | 5 |
| Over 150 " | 0 |
| Total | 129 |

The average time for these 129 cases was 33 days; the longest time for any family was 139 days. This represents only those cases who allowed examinations to be made at reasonable intervals. Quarantine was greatly, and unnecessarily lengthened in many cases by the unwillingness of the parents to submit to the necessary supervision by the health authorities.

CONCLUSIONS.

(1) The epidemic that existed in the school was due to three factors—first, the existence of mild cases of diphtheria that, because of the lack of bacteriological examination, went unrecognized as diphtheria; second, the insufficient length of quarantine in clinical cases; and, third, germ cases following exposure and never showing clinical symptoms.

(2) Our attempts to isolate all infected children had no effect on the course of the epidemic, so long as we made throat cultures alone. When we took both nose and throat cultures, and quarantined all the children showing positive cultures, the epidemic stopped.

(3) It is extremely important, in times of danger from diphtheria, that every sore throat, no matter how far it may seem to be from diphtheria, be regarded as suspicious, until a bacteriological examination has proved it to be otherwise.

(4) It is such a frequent occurrence to have a positive follow a negative culture, that at least two negatives should be demanded for release from quarantine. No case should be released on clinical signs alone.

(5) It is possible to stop epidemic diphtheria in a public school by regulation of attendance by bacteriological findings.

It would have been impossible to carry on the work involved in these examinations had it not been for the help of Dr. A. F. Gillihan and Dr. C. M. Haring and Mr. W. T. Jane, in examining cultures. We are also indebted to numerous medical students for assistance in making cultures, a labor carried on at times under conditions such as to try the patience severely.

From the State Hygienic Laboratory University of California, Berkeley.

1. H. W. Hill, Thirty-first Annual Report of the Health Department of the City of Boston, 1902, p. 76.

2. B. R. Rickards. The value of two consecutive negative cultures as a method of releasing diphtheria patients. American Journal of Public Hygiene and Journal of the Massachusetts Association of Boards of Health, Vol. XVI., November 1906, No. 4, p. 25.

3. Wesbrook, Wilson, McDaniel and Adair. A preliminary communication on bacillus diphtheriae and its variants in a school in which diphtheria was endemic. British Medical Journal, April 16, 1898.

Wesbrook. Report of the Bacteriological Laboratory. Report of the Minnesota State Board of Health for 1897-1900, p. 497.

4. Report on Diphtheria Bacilli in Well Persons, by a committee of the Massachusetts Association of Boards of Health. Journal of the Massachusetts Association of Boards of Health, July, 1902.

## SUGGESTIONS ON METHODS OF ATTACKING TYPHOID FEVER IN SAN FRANCISCO.

By H. A. RYFKOGEL, M. D., San Francisco.

It will not be necessary to enter now into a discussion of the etiology of typhoid fever since it may be considered as established and this paper will deal very briefly with the points by which the disease is carried, the methods to be adopted in studying the present endemic in San Francisco, and finally the means that should be used to prevent the further spread of, and stamp out, the disease.

It was long taken for granted that typhoid fever was purely a water borne disease and although it was realized that the disease was transmissible by contact, the importance of this method of spread was not realized, and the role that flies played was practically unknown.

The majority of endemics and epidemics in cities occur as a result of water infection, and the number of cases depends on the dilution of the infecting material. The dilution is determined by the area of the water shed and rainfall, that is by the amount of water, by the distance of the first infected point from the distributing pipe, by

the amount of excreta reaching the mater and by the stage of the disease in the patient. Thus, if all the dejecta of a typhoid case should reach the reservoirs that supply a city, or should the same material enter a stream a short distance above the intake of a town water supply, the resulting epidemic would be sudden in onset and the cases numerous. The further away the point of infection is from the intake, the less in number will be the resulting cases, partly by reason of greater dilution and partly because of the natural purification that occurs as a result of gravitation, etc.

In towns which draw their water from rivers which have passed through settled country, typhoid is usually endemic, because the river receives the excreta from the places above which have been infected in some manner from the river and also from small villages and isolated farmhouses, etc., in which infection is kept alive by means of flies.

A sudden epidemic may occur when the town water is not infected, because the water supply of one or more of the dairies supplying the town with milk and butter, has become contaminated. The milk-can is infected while being washed, and as milk is an excellent medium for the growth of the bacillus typhosus, its infectivity is multiplied manyfold before it reaches the consumer. It will be recalled that the recent epidemic in Palo Alto was produced in this way.

It is exceedingly difficult to isolate the bacillus typhosus from water under natural conditions, but fortunately we have an index of the presence of fecal matter in the form of the bacillus soli communis. It must not be supposed that the presence of this organism proves that the water is infected with the bacillus typhosus or even necessarily contaminated with sewage. Its presence, and more particularly its abundance, are, however, very suggestive and always demand an investigation of its source; that is to say, the water from all streams and pipes entering the infected reservoir should be examined and the infected one traced up for the point of contamination.

Where the source of the colin baccili cannot be found, and if they should be numerous, say more than one to the centimeter, the water from the infected reservoir should be condemned or subjected to effective filtration.

Th camp epidemics of the Spanish-American and South African wars first attracted attention to the role that flies played in the transmission of typhoid fever. Although the water supplies were not infected, nevertheless between two and three months after the formation of the camps severe epidemics of typhoid appeared, and Reed, Vaughan and Shakespeare, who were appointed to study the outbreak, came to the conclusion that flies were largely responsible.

Several investigators have shown that after a fly had fed on typhoid discharge, the bacillus can be cultivated from the insect's excrement. Minute particles of feces also adhere to its hairy legs and if a fly is made to walk first on typhoid feces and then on a gelatin plate, the bacillus typhosus can be cultivated from the resulting colonies.

When a fly infects milk in this manner, the bacillus rapidly multiplies and infection is more certain than when food is infected. Epidemics in which flies play the leading role are much more gradual in onset than the severe water borne epidemics and a period of two, three or four months usually elapses between the establishment of a camp whose occupants use open latrines and the appearance of any great number of typhoid cases. The reason for this is obvious.

For this reason the late epidemic in this city was predicted by many physicians, and in a report made by me to the Board of Health about the middle of May (1906), I stated that the non-appearance of typhoid at that date merely signified that the water had not become contaminated, and insisted that unless immediate steps were taken to clean and properly screen the many filthy latrines then existing, numerous cases of typhoid would appear about three months after the earthquake.

The cases of typhoid that occur in country and mountainous districts where the water is pure, are probably fly borne. The number of cases in fly epidemics depends on the number of flies and their opportunities for feeding on infected material.

The common house-fly lays its eggs in horse manure and in warm weather completes its cycle of growth in a few days. In cool weather it takes very much longer to develop. Flies are much more active in warm than in cool weather, and for these two reasons the insects are much more numerous during warm weather. The presence of suitable food such as garbage, etc., has a definite influence on their number and activity. Their opportunity for feeding on typhoid infected material depends on their access to the feces and urine of a patient suffering from the disease.

Feces and urine on the surface of the earth or on soiled clothing, etc., give them an ideal opportunity. The deeper and darker a latrine is dug, the less liable is it to harbor flies, and in the absence of flushing or screening facilities, very deeply dug and darkened latrines are good preventive measures. Superficially dug, light latrines harbor many flies and further tend to infect the soil in which bacillus typhosus may live long and even multiply.

In this connection we may mention the capacity for harm of ambulatory cases which bear the same important relation to the spread of typhoid as in malaria, plague, yellow fever, etc. The ambulatory typhoid, particularly if suffering from diarrhoea, will infect latrines and urinals, his own clothing and eating utensils, and the people with whom he comes in contact. The bed patient, on the contrary, is a known source of infection and can be specifically dealt with. Thus it is the ambulatory cases first bring typhoid to a city whose water supply is not inspected. It is these cases coming from the country at first, but now also developing locally, that San Francisco must fear and guard against.

Contact infection plays a large part in the trans-

mission, as is proved by the numerous cases occurring among nurses and doctors in hospitals. In the Spanish-American war this method of transmission seemed to bear a very important part. Certain small epidemics have also been due to infected oysters, but they probably play no part in the San Francisco cases.

In San Francisco, after April 18th, the conditions were such that we could hardly hope for the good fortune to escape an invasion of typhoid fever. The city at a moment's notice lost the use of flushing closets and had to be without them for a month. During another period extending to the present, a large proportion of the population have had to continue as in the first period, using latrines. Owing presumably to the lack of funds many of these latrines were for a long time improperly constructed and not a few still remain so and the spasmodic dusting with chloride of lime or sprinkling with carbolic acid could hardly do more than transiently substitute one disagreeable odor for another somewhat less so.

### Suggestions.

Constant watch must be kept on our water supply because although not infected it might readily become so. Every latrine in the city must be hunted up, and if it is not properly built it must be made so. The burned district should be thoroughly gone over and ample toilet facilities provided in every block where men are working. When possible flush closets should be built; when this is impracticable a screened latrine with double spring doors should be used. Under the seat should be placed a galvanized iron container holding a solution of cheap disinfectant, such as lime. This container should be emptied daily.

If it is impossible to arrange a system for emptying the pails, a portable screened double-doored latrine should be placed over sewer manholes, or over earth holes, at least 6 feet deep and not more than two feet wide in its narrowest diameter in order that its depth and darkness will bar out the flies. When the sewer manhole is used it should be daily cleaned and flushed with a stream from a fire-hose. When an earth hole is used a box of dry earth should be at hand and directions posted to cover every stool therewith. The fecal mass should be thoroughly covered by a laborer once a day. When the latrine fills to within four feet of the surface it should be filled in and a new one dug. The covering of the fecal mass every day or so with chloride of lime or crude carbolic acid is of but little value, since flies will attack the first stool deposited after treatment with either of the substances. It certainly cannot be expected that they disinfect the mass on which they are placed. If this were desired it would be necessary to thoroughly mix the disinfectant and feces in proper proportion. To prevent flies lighting on feces they must be immersed in a disinfecting solution and when containers are used the only safe system is to use both screens and solution.

The inspection of latrines could be done by the police, and it would take but a few responsible medical inspectors to instruct and watch the police.

During the prevalence of typhoid in a community, the people should be urged to eat no uncooked food, that is liable to be infected by flies or dust. Physicians should be on the lookout for ambulatory cases, and these should be immediately put to bed and properly handled.

Those handling typhoid patients should be taught that the feces and urine and sometimes sputum contain the bacillus and are consequently a source of danger. Early recognition of cases is of the utmost importance and suspected cases should be considered typhoid until proven otherwise. Typhoid patients should not be kept in the same room or ward with patients suffering from other diseases, and the apartment in which they are located should be carefully protected from flies. Every discharge of feces or urine should be thoroughly disinfected. The sputum should be destroyed. Eating and drinking utensils, bedding, towels, gowns, etc., should be all soaked in a disinfecting solution a sufficient length of time before removal from the ward. The attendant should wear gowns which are removed before leaving the ward and the nurse when handling the patient should wear gloves.

## THE MANAGEMENT OF PLACENTA PREVIA, WITH A REPORT OF SEVEN CASES.*

By A. B. SPALDING, M. D., San Francisco.

Placenta previa is not such a rare obstetrical complication but any physician in general practice of medicine may at any hour be suddenly and most unexpectedly called upon to manage this dramatic obstetrical crisis. To know that one is dealing with a condition so liable to end fatally to both mother and child; to know that by modern methods of management more mothers at least can be saved than by the older methods; to know that spectacular but ineffectual efforts are constantly being made to lower the high fœtal mortality, gives much material for thought and conjecture.

Holmes[1] sums up the maternal and fœtal mortality in placenta previa in 2756 cases, reported in the literature since 1877, and compares the results with the statistics of Read & Muller for the mortality in 1975 cases occurring in the pre-antiseptic days, as follows:

| Holmes Cases. | Maternal Mortality. | Fœtal Mortality. |
|---|---|---|
| Complete | 13.4 % | 80.5% |
| Incomplete | 4.3 % | 50.5% |
| Total | 7.36% | 54.1% |
| Read & Muller Cases. | | |
| Complete | 30.9 % | 67.5% |
| Incomplete | 15.0 % | 51.5% |
| Total | 23.6 % | 63.1% |

So many of these patients give a clear history of

* Read at the Thirty-seventh Annual Meeting of the State Society, Del Monte, April, 1907.